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Abstract

In this paper, we analyze data on trends since 2000 in foreign holdings of government securities and other debt securities, with emphasis on Japan and developing Asia. We find that foreign residents generally increased their holdings of Asian debt securities during the sample period and in particular during the post-global financial crisis (GFC) period. Meanwhile, foreign holdings of debt securities have been declining in the eurozone. Foreign holdings of short-term debt securities were very volatile during the GFC period (2009–11), with a sharp drop in foreign holdings of short-term Asian debt securities that was followed by a renewed surge. Our empirical analysis suggests that despite the increase in foreign holdings of debt securities its share is still far lower than the optimal portfolio warranted by the capital asset pricing market theory. In other words, foreign investors' home bias is still strong. The overall increase in foreign holdings of Asian debt securities appears to be driven by relatively stable exchange rates and the higher risk-adjusted returns on the debt securities of the region. Additionally, we find that investors were more "home-biased" during the GFC period and invested less in the markets of the major industrialized economies.

Keywords: Government debt; government securities; government bonds; government bills; government notes; debt securities; debt financing; debt holdings; foreign debt holdings; international capital flows; short-term capital movements; cross-border portfolio investments; safe haven; home bias; capital asset pricing model; optimal portfolios; global financial crisis; eurozone; Japan; developing Asia

JEL Classification: F32, F34, G15, and O53

1. Introduction

If capital is perfectly mobile internationally, it should flow to the economy offering the highest rate of return (controlling for risk), and economies suffering from a shortage of domestic capital should be able to attract foreign capital by offering the global rate of return. A corollary of this proposition is that governments and firms should have no trouble selling debt securities to domestic and foreign investors alike by offering the global rate of return. In its simplest form, the international capital asset pricing model (CAPM) predicts that, in equilibrium, all investors will hold the same portfolio—the world market portfolio—in which each country's portfolio is weighted by its market capitalization.

However, as Feldstein and Horioka (1980), Obstfeld and Rogoff (2001), and the related literature have shown, investors exhibit a strong tendency toward "home bias," preferring to invest their wealth in domestic assets for a variety reasons including a desire to avoid foreign exchange risk, an asymmetry in the availability of information about domestic and foreign assets, and legal and institutional barriers to international capital flows.

Nonetheless, investors do invest at least some of their assets abroad, and cross-border portfolio investments have increased. Investments in foreign debt securities have increased sharply in recent years, with their share of cross-border portfolio investments increasing between 2005–07 and 2010 in most Asian economies (with the exception of Hong Kong, China; the Philippines; and Singapore). Thus, in this paper, we focus in particular on cross-border investments in the debt securities of Japan and developing Asia.

Some investors invest in "safe havens," which are economies offering stable risk-adjusted returns, as a temporary (short-term) repository for their liquid assets in response to increased political and/or economic instability abroad, while other investors invest in economies with strong growth prospects and/or strong prospects for currency appreciation as a long-term investment (Isard and Stekler 1985, Dornbusch 1986, and Habib and Stracca 2011).

This paper contributes to the literature by analyzing data on trends in foreign holdings of debt securities since 2000, with emphasis on Japan and developing Asia, by presenting new econometric evidence on the factors affecting changes in foreign holdings of debt securities and focusing on differences between the pre- and post-global financial crisis (GFC) periods and on the short-term debt securities of developing Asia. We find that foreign investors generally increased their holdings of the debt securities of developing Asia during the sample period, in particular during the post-GFC period. Meanwhile, foreign holdings of debt securities have been declining in the eurozone. Foreign holdings of the short-term debt securities of developing Asia were very volatile during the GFC period (2009–11), showing a sharp drop that was followed by a renewed surge.

Our econometric analysis suggests that, despite the increase in foreign holdings of debt securities, their share is still far lower than the optimal portfolio warranted by the CAPM. In other words, foreign investors' home bias is still very strong. Home bias became even stronger during the GFC period, with the exception of developing Asia where foreign

holdings remained stable, with foreign investors investing less in the major industrialized economies. The overall increase in foreign holdings of developing Asia's debt securities appears to be driven by relatively stable exchange rates and higher risk-adjusted returns. Additionally, we find that inertia is less evident in the case of foreign holdings of short-term debt securities and that they tend to be more volatile than foreign holdings of longer term debt securities.

The remainder of this paper is organized as follows. In section 2, we describe the data sources used in this paper. In section 3, we present data on trends in foreign debt holdings in Japan and developing Asia in 2000–11. In section 4, we discuss the econometric framework and estimation results. Finally, in section 5, we summarize our findings and explore the policy implications for both Japan and developing Asia.

2. The Data Sources

The data on trends in government debt financing in Japan in subsection 3.1 are taken from the Bank of Japan's Flow of Funds Accounts (FFA) Statistics. The FFA records movements of financial assets and liabilities among institutional units called sectors, such as financial institutions, corporations, and households, for various financial instruments called transaction items, such as deposits and loans. Thus, the FFA includes data on holdings of government securities by each sector of the economy and hence can shed light on who is financing Japan's government debt. For a more detailed description of the FFA in English, refer to http://www.boj.or.jp/en/statistics/sj/index.htm/. The data on Japan in this survey are taken from, and hence are identical to, the Bank of Japan's Balance of Payments Statistics.

The data on foreign debt holdings by economy or region in subsection 3.2 are taken from the Coordinated Portfolio Investment Survey (CPIS) of the International Monetary Fund (IMF), which collects year-end data on portfolio investment holdings (equity and debt securities) from participating economies.

The data on bond yields, forward rates, and exchange rates in section 4 are taken from Bloomberg. Yields and forward rates on 3-year bonds are used for the full sample, while yields and forward rates on 12-month bonds are used for the short-term securities sample.

The data sources used to construct the "home bias index" or the "foreign asset acceptance rate" in section 5 are described in detail in the Data Appendix. The data sources for the other variables used in section 5 are as described above.

3. Trends in Foreign Debt Holdings in Japan and Developing Asia

3.1 Trends in Foreign Holdings of Japanese Government Securities, 2000–2011

In this subsection, we discuss trends in foreign holdings of Japanese government securities, which comprise the lion's share of debt securities in Japan, in 2000–2011.

Figures 1–3 show trends in foreign holdings of Japanese government securities in 2000–2011 for both short-term and medium- and long-term securities. As can be seen from these figures, the share of foreign holdings of Japanese government securities has been low until recently in the case of both short-term and medium- and long-term government securities, with the share of foreign holdings of short-term government securities ranging from 2.4%–7.3% and that of medium- and long-term government securities ranging from 2.7%–6.7% between March 2000 and September 2007.

However, the two shares diverged greatly thereafter: The share of foreign holdings of short-term government securities increased sharply to 14.8% in June 2008 before falling to 10.1% in December 2008 and increasing anew to 17.0% in March 2011 before leveling off. Meanwhile, the share of foreign holdings of medium- and long-term government securities remained low throughout the period under review, only increasing to a high of 7.8% in September 2008 before falling to 4.6% in March 2010 and increasing anew to 6.3% in September 2011.

Thus, the share of foreign holdings of government securities increased in the case of both short-term and medium- and long-term government securities but increased much more sharply and was often more than twice as high in the case of short-term government securities. This suggests that the growth in the appetite of foreign investors for Japanese government securities was much greater in the case of short-term securities, which in turn suggests that foreign investors regarded Japan as a safe haven for their assets in the short-run but not in the medium- or long-run, and this in turn suggests that foreigners regarded Japanese government securities as a temporary or short-term repository for their funds.[1]

Turning to comparative data for other economies to put the figures for Japan in perspective, the share of foreign holdings of Italy's government debt was 44% in 2010, according to IMF estimates, and 47%, according to Morgan Stanley estimates. The corresponding figure for the United Kingdom (UK) was 32% in 2010, according to an article in the 28 April 2010 issue of *Keizai Rebyuu* (Bank of Tokyo-Mitsubishi UFJ). Finally, the share of foreign holdings of United States (US) Treasuries increased sharply from 17% in 2001 to 31% in 2011, according to US government data. As shown above, the corresponding figure for Japan has been at most 17% for short-term securities and

[1] The growing preference of foreign investors for short-term Japanese government securities may have been due in part to the low yields on Japanese government securities and the desire of foreign investors to avoid large losses if yields were to rise in the future. We are indebted to Thiam Hee Ng of ADB's Office of Regional Economic Integration (OREI) for making this point.

8% for medium- and long-term securities. Thus, the share of foreign holdings of government securities is much lower in Japan than in Italy, the UK, or the US.

Figure 4 shows data from the *AsianBondsOnline* database of the Asian Development Bank (ADB) on trends in the share of foreign holdings of government bonds in selected Asian economies in 1996–2011. As can be seen from this figure, the share of foreign holdings of local currency (LCY) government bonds is much higher in Indonesia (as high as 34%) and Malaysia (24%) than in Japan (6%). The share of foreign holdings of government bonds used to be much higher in Japan than in the Republic of Korea or Thailand, but the Republic of Korea has exceeded Japan since 2007, reaching 11%, and Thailand has exceeded Japan since 2011, reaching 11%–12%. Thus, Japan has been overtaken by many Asian economies with respect to foreign holdings of government bonds, and the share of foreign holdings of government securities in Japan appears to be much lower than both the industrialized economies of the US and Europe and the developing Asian economies.

3.2 Trends in Foreign Holdings of Developing Asia's Debt Securities, 2000–2011

In this subsection, we present data on trends in foreign debt holdings, which consist primarily of foreign holdings of government securities, in developing Asia to highlight the similarities and differences vis-à-vis Japan. Figure 5 shows data on trends in the share of each economy or region in the total foreign debt holdings of developing Asia. As can be seen from this figure, the US is by far the largest foreign debt holder. Meanwhile, Asia (especially East Asia) and the eurozone economies are of roughly comparable importance and the UK is of lesser importance (except until 2004). Trends in the total foreign debt holdings of each economy or region in developing Asia are not shown due to space limitations, but these data show that foreign debt holdings increased from 2001 until 2007, declined in 2008, and increased anew in 2009–10 to attain all-time highs in 2010. Thus, trends are similar to those of foreign holdings of short-term government securities in Japan, at least after 2007, with sharp increases in foreign holdings after 2007 in Japan as well as in developing Asia except in 2008. With respect to trends in foreign debt holdings by economy or region, all economies and regions show similar trends, but the foreign debt holdings of the eurozone economies have shown a sharper upward trend than those of other economies and regions since 2008, suggesting that the "flight to quality" has been more pronounced in Europe due to the advent of the eurozone crisis.

Data on trends in the share of short-term foreign debt in total foreign debt in various regions of the world, and various economies and regions in Asia, are not shown due to space limitations, but these data reveal that the share of short-term foreign debt in total foreign debt shows considerable variation from region to region, being highest in the US and Asia, intermediate in the eurozone economies, and lowest in Latin America. Within Asia, total foreign debt is the highest in the People's Republic of China throughout the period under review, in South Asia in the earlier years, and in Japan in later years and

much lower in the ASEAN-4 economies[2] plus Viet Nam and in the newly industrialized economies (NIES),[3] perhaps because of their growing attractiveness as a destination for long-term capital (Rodrik and Velasco 1999). As for trends over time, the share of short-term foreign debt in total foreign debt has been declining in the US, increasing sharply in Asia (especially the People's Republic of China and Japan), increasing moderately in the eurozone economies, and declining in South Asia and (at least since 2007) in ASEAN-4 plus Viet Nam and the NIES. Thus, the sharp upward trend in the share of short-term foreign debt in total foreign debt is unique to Asia, especially Japan and the People's Republic of China, and the level of this share is now highest in Asia, especially in Japan and the People's Republic of China.

Thus, capital is fleeing—from the US and eurozone economies—not only to Japan but also to other Asian economies, due in large part to the development of bond markets in developing Asia, with short-term capital fleeing primarily to the People's Republic of China, Japan, and South Asia and long-term capital fleeing primarily to ASEAN-4 economies, Viet Nam, and the NIES. It thus appears that the destination of capital flight depends on the investors' motivation, with those seeking a temporary safe haven choosing the People's Republic of China, Japan, and South Asia, which presumably provide good short-term risk-adjusted yields, and those seeking a long-term home for their funds choosing ASEAN-4 economies, Viet Nam, and the NIES, which all have good long-term growth prospects. Our assertion is corroborated in the case of the Republic of Korea by Cho (2011), who finds that foreign investors have increased their net purchases of medium- to long-term government securities of the Republic of Korea since the GFC due to (i) favorable growth prospects and sound economic indicators (e.g., a current account surplus and fiscal soundness) in the Republic of Korea, (ii) expectations of the Korean won's appreciation, and (iii) the desire of the central banks of the People's Republic of China and other Asian economies to diversify their foreign reserve investments.

However, the unusually high share of short-term foreign debt in total foreign debt in the People's Republic of China was due in large part to People's Republic of China government regulations that prohibited offshore foreign banks from purchasing long-term People's Republic of China government securities until August 2010. Thus, at least until 2010, the fact that the share of short-term foreign debt in total foreign debt was high in the People's Republic of China does not necessarily indicate that foreign investors regarded the People's Republic of China as a temporary safe haven for their funds. Moreover, the People's Bank of China's (PBOC) circular of 20 August 2010 allowed only offshore central banks and other eligible financial institutions to purchase long-term People's Republic of China government securities, and since the decision-making calculus of central banks is likely to be very different from that of other financial institutions, we need to be cautious about interpreting the motivation behind foreigners' purchases of People's Republic of China debt after 2010 as well.

[2] Association of Southeast Asian Nations (ASEAN)-4 refers to Indonesia, Malaysia, the Philippines, and Thailand.

[3] The NIES comprise Hong Kong, China; Republic of Korea; Singapore; and, Taipei,China.

4. Reasons for the Sharp Increase in Foreign Holdings of Short-Term Japanese Government Securities and the Debt Securities of Developing Asia

4.1 Relative Yields

One possible reason for the sharp increase in foreign holdings of short-term Japanese government securities and of the debt securities of developing Asia is that their yields increased relative to the yields on the debt securities of other economies and regions. Figure 6 shows trends in hedged returns on 1-year government bonds in US dollars in six economies and regions (the US, the eurozone, the People's Republic of China, India, Japan, and the Republic of Korea) in 2005–12. As can be seen from this figure, yields on Japanese debt securities were the lowest among the six economies and regions throughout this period and were far lower than elsewhere. However, yields elsewhere fell sharply in 2008–09 due to monetary easing in response to the Lehman Brothers crisis, and this in turn caused the yield gap between Japan and elsewhere to narrow sharply; that is, it caused yields in Japan to become much more attractive relative to those elsewhere. (Note, however, that even though the yield gap narrowed significantly, yields remain somewhat lower in Japan than elsewhere.) To put the argument in different terms, the wide yield gap between Japan and elsewhere until 2007 led to extensive yen carry trades, wherein investors borrowed from Japanese banks at low rates, converted their funds into US dollars, for example, and purchased higher-yielding US government securities although the incentive to do so diminished after 2007 as the yield gap narrowed, leading investors to invest in Japanese government securities instead.[4] Thus, the sharp narrowing of the yield gap between Japan and elsewhere can explain why holdings of short-term Japanese government securities increased so sharply after 2007.

As for the increase in foreign holdings of the debt securities of developing Asia since 2001 (except in 2008), the upward trend in yields in the People's Republic of China, India, and the Republic of Korea before 2007 and after 2009 (except in the Republic of Korea after 2009) and the sharp decline in yields in these economies in 2008 can help explain these trends.

4.2 Relative Risks

Another possible reason for the sharp increase in foreign holdings of short-term Japanese government securities and of the debt securities of developing Asia are changes in risk levels in different economies and regions. Figure 7 shows trends in the rolling average of the standard deviation of hedged returns on 1-year government bonds in US dollars in the same six economies and regions in 2005–11. As can be seen from this figure, the risk gap between Japan and elsewhere was relatively narrow until late 2008, even though risk levels were somewhat lower in Japan than elsewhere. However, the risk gap widened dramatically from late 2008 until early 2010, not because risk levels in Japan changed but because risk levels elsewhere increased sharply due to the advent

[4] We are indebted to Joseph Lim of the University of the Philippines for this interpretation.

of the eurozone crisis. Thus, the sharp widening of the risk gap between Japan and elsewhere—the fact that Japanese debt securities became much safer than those of other economies—can explain why holdings of short-term Japanese government securities increased so sharply after 2007.

In other words, foreign investors temporarily shifted their assets into short-term Japanese government securities following the Lehman Brothers crisis due to their perception of Japan as a safe haven and their perception of Japanese short-term government securities as a relatively safe asset. However, the fact that foreign investors purchased primarily short-term securities implies that they are likely to expatriate their resources once yields in the eurozone return to "normal" levels.

According to a 2011 Bank of Japan report, foreign investors temporarily shifted their assets into short-term Japanese government securities following the outbreak of the eurozone crisis in May 2010, and this trend continued the third quarter of 2010 due to their perception of Japan as a safe haven. This corroborates the importance of the second reason: that it was the widening of the risk gap between Japan and other economies that was responsible for the increased foreign holdings of Japanese government securities.

As for trends in foreign holdings of the debt securities of developing Asia, the fact that risk levels in the People's Republic of China, India, and the Republic of Korea increased more sharply than in the US, the eurozone, and Japan in 2008–09 can explain why foreign holdings of the debt securities of developing Asia fell sharply in 2008, but trends in risk levels cannot explain the increase in foreign holdings of the debt securities of developing Asia in other years. It appears that developing Asia was not regarded as a safe haven since risk levels increased more sharply in developing Asia than elsewhere at the time of the Lehman Brothers crisis.

4.3 The Combined Impact of the Two Factors

Figure 8 shows trends in risk-adjusted hedged returns on 1-year government bonds in US dollars in the same six economies and regions in 2005–11. This variable shows the combined impact of yields and risk levels. As can be seen from this figure, risk-adjusted hedged returns on 1-year government bonds in US dollars were much lower in Japan than elsewhere until 2007, but risk-adjusted hedged returns elsewhere converged to Japanese levels in 2008–09 and remained below Japanese levels thereafter in some cases.

Thus, the two factors (yields and risk levels) in combination can explain why foreign holdings of short-term Japanese government securities increased so sharply after 2007, inducing foreign investors to at least temporarily shift their portfolios from non-Japanese (eurozone) government securities to Japanese government securities. This suggests that conventional economic factors (risks and returns) can explain the behavior of foreign investors without having to resort to non-economic explanations. However, it appears that conventional economic factors can only partially explain trends in foreign holdings of the debt securities of developing Asia.

However, the sharp increase in foreign holdings of short-term Japanese government securities was largely attributable to central banks, especially the PBOC, and central banks may have very different motivations from those of private investors. For example, these central banks wanted to diversify away from US government securities for various reasons and chose to shift into short-term Japanese government securities since they are more liquid than longer-term securities and hence more suitable for holding as foreign exchange reserves.[5]

Unfortunately, a breakdown of foreign holdings of Japanese government securities by type of holder is not available and hence we cannot ascertain the importance of this central bank hypothesis directly. However a breakdown of foreign holdings of Japanese government securities by economy and region is available, and in the case of short-term debt, Europe (excluding the UK) was the largest foreign holder of short-term Japanese debt in 2003–04 and 2007–09, while international institutions were the largest foreign holder of Japanese debt in the intervening years of 2005–06 and again in 2010–12. By contrast, the importance of the ASEAN economies as holders of short-term Japanese debt has increased sharply in recent years, rising to a third place ranking in 2009 and to second place in 2010–11. Thus, the People's Republic of China has not held a dominant share of short-term Japanese debt until recently, suggesting that the central bank hypothesis has not been of dominant importance, at least until recently.

5. An Econometric Analysis of Foreign Holdings of Debt Securities

5.1 Deviation from CAPM and Home Bias

As discussed in the previous section, foreign holdings of Asian debt securities have been increasing in recent years. What was particularly noticeable during the GFC period of 2009–11 is that foreign holdings of short-term debt securities showed volatile movements, with a sharp drop followed by a renewed surge in some developing Asian economies, from almost none in previous years in some economies.

Solnik (1974) and Sercu (1980) show that in a fully integrated world in which purchasing power parity (PPP) holds, the international version of the CAPM of Sharpe (1964) and Lintner (1965) will also hold and that, in equilibrium, all investors will hold the world market portfolio, with each country's portfolio being weighted by its market capitalization because the CAPM assumes that all investors have identical expectations regarding the mean and variance of future returns on all securities and apply the same portfolio optimization procedure. Thus, for example, as the US stock market accounts for about 45% of world stock market capitalization, the CAPM predicts that all investors will invest about 45% of their equity wealth in the US stock market.

If the CAPM holds, the surge in foreign holdings of short-term Asian debt securities at the time of the GFC is not necessarily surprising since debt securities markets in Asia

[5] We are indebted to an anonymous referee for this point.

deepened significantly during the same period and foreign holdings of debt securities should have increased commensurately with the increase in market capitalization. However, the evidence presented by French and Poterba (1991) shows that the share of their portfolios that countries invest in foreign securities is much too low compared to simple benchmarks derived from the CAPM and hence that the CAPM does not hold, and the fact that non-US investors only invest 8% of their equity wealth in the US points toward the same conclusion.

In this section, we conduct an econometric analysis of foreign holdings of debt securities using the foreign asset acceptance rate or home bias index, which controls for relative market size and measures the deviation from the optimal portfolio as warranted by the CAPM. This index was computed by the IMF (2005) as follows:

$$l_{i,t} = \frac{\frac{DD_{i,t}}{WDMC_t - DDMC_{i,t}}}{\frac{DDMC_{i,t}}{WDMC_{i,t}}} \quad (1)$$

where $DD_{i,t}$ measures country *i*'s domestic debt securities held by foreign investors, $WDMC_t$ measures the worldwide market capitalization of debt securities, and $DDMC_{i,t}$ measures the market capitalization of country *i*'s domestic debt securities. Eleven economies are included in the sample: seven developing Asian economies (Hong Kong, China; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore; and Thailand) and four major industrialized economies or regions (the Eurozone, Japan, the UK, and the US). Finally, t spans from 2001 until 2011.

If there is no home bias, the index $l_{i,t}$ should equal unity. However, if foreign investors exhibit home bias for various reasons, foreign holdings of country *i*'s assets will tend to be smaller than what the relative domestic market size would imply, leading $l_{i,t}$ to be less than unity.

We computed the home bias index for the eleven economies in our sample, and our results are shown in Figures 9 and 10. We found, in general, that the index is less than unity, suggesting the presence of home bias. Foreign holdings of the debt securities of developing Asian economies are still very limited and far lower than what their share of worldwide market capitalization would imply. Among the economies in our sample, the Eurozone economies show the highest index value, implying that the share of foreign holdings in these economies is close to 80% of the optimal share. Since the GFC, however, foreign holdings of Eurozone debt securities have been declining steadily and the downward trend became evident with respect to short-term securities as well in 2009.

The US shows the second highest value of the home bias index among the economies in our sample, but its value is far lower than it is in the Eurozone economies, implying that the share of foreign holdings in the US is only 30% of the optimal share. However, unlike in the Eurozone economies, the US did not show a decline in foreign holdings of

total debt securities during the post-GFC period, although it did show a moderate decline in foreign holdings of short-term debt securities.

The home bias index is low, in general, in Asia, but when one conducts a comparison within Asia, foreign investors underinvest the most in the debt securities of Japan and Thailand. Foreign investors also underinvest in the debt securities of the Republic of Korea, but foreign holdings of Korean debt securities have been increasing steadily since 2007. Foreign holdings of the debt securities of Malaysia; the Philippines; Indonesia; Hong Kong, China; Singapore; and Thailand have increased during the sample period, except in 2008–09 when there was a sharp drop in foreign holdings. The home bias index showed volatile movements in many economies around the time of the GFC (2007–09), with this index dropping sharply before rebounding and with these trends being particularly pronounced in some Asian economies.

5.2 Econometric Model

The objective of this section is to examine econometrically whether or not these trends can be explained by changes in home bias during the GFC period or by other factors such as the return chasing motive, as discussed in the previous section. The specification follows a simplified version of a portfolio selection model with standard mean-variance such as those of Adler and Dumas (1985) and Cooper and Kaplanis (1994), where purchasing power parity (PPP) can be violated. In such a model, deviations from optimal portfolio weights (portfolio bias) can be explained by exchange rate volatility. The deviation from the optimal portfolio weight (home bias) can be measured as $ln\left(\frac{DD_{i,t}}{WDMC_t - DDMC_{i,t}}\right) - ln\left(\frac{DDMC_{i,t}}{WDMC_{i,t}}\right)$. and increases with real exchange rate volatility, which measures the degree to which relative PPP is violated. The share of a specific asset can deviate from the optimal portfolio for many reasons.

Any deviation of the exchange rate from PPP drives a wedge between real returns on domestic and foreign investment under the assumption that the variances of nominal returns are identical within asset classes. As a robustness test, we also try using the change in the portfolio weight based on the risk-adjusted return on assets in place of the exchange rate volatility measure.

We use the following specification:

$$\begin{aligned} ln\left(\frac{DD_{i,t}}{WDMC_t - DDMC_{i,t}}\right) &= \alpha_0 + \alpha_1 ln\left(\frac{DDMC_{i,t}}{WDMC_{i,t}}\right) + \alpha_2\left[ln\left(\sigma_{i,t}\right)\right] + \alpha_3\left[rr_{i,t}\right] \\ &+ \alpha_4 ln\left(\frac{DD_{i,t-1}}{WDMC_{t-1} - DDMC_{i,t-1}}\right) + \alpha_5 X_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{2}$$

where $ln\left(\frac{DD_{i,t}}{WDMC_t - DDMC_{i,t}}\right)$ is the natural logarithm of actual foreign holdings of debt securities as a share of foreign market size, while $ln\left(\frac{DDMC_{i,t}}{WDMC_{i,t}}\right)$ is the natural logarithm of the relative size of the domestic debt securities market. α_1 should equal one if there is no home bias. $ln(\sigma_{i,t})$ is the natural logarithm of the average standard deviation of monthly bilateral real exchange rate changes in country *i* at time *t*, and $rr_{i,t}$ is the natural logarithm of the risk-adjusted dollar return on the debt securities of country *i* at time *t*. The dollar (hedged) return is calculated as the bond yield adjusted for the foreign exchange rate. The risk-adjusted return is then derived by dividing the hedged return by the return volatility defined as the standard deviation of the monthly hedged return at time *t*. $X_{i,t}$ is a vector of other variables that are included in the specification. $\varepsilon_{i,t}$ is an error term. A one-period lag of the dependent variable, $ln\left(\frac{DD_{i,t}}{WDMC_t - DDMC_{i,t}}\right)$, is also included.

The equation is estimated using a fixed effects model as well as a tobit model, which corrects for censoring of the dependent variable. Again, the sample includes eleven economies: seven developing Asian economies (Hong Kong, China; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore; and Thailand) and four major industrialized economies or regions (the Eurozone, Japan, the UK, and the US). *t* spans from 2001 to 2011. Various specifications were estimated for both the full sample and for the developing Asia sample.

Econometric tests of the portfolio selection model with standard mean-variance typically use data on equities, but it can also be applied to debt securities, as we do, because debt securities are also risky assets. In fact, at least one study (Fearnley 2002) has tested this model including both equities and government bonds.

5.3 Estimation Results

Tables 1 and 2 report the estimation results. Table 1 reports the results for four specifications (Panels A–D) for both the full sample and the developing Asia sample for foreign holdings of debt securities of all maturities. As can be seen from this table, the estimated home bias coefficients α_1 are generally consistent with previous studies (Fidora et al. 2006) and with what the international CAPM predicts. A country whose market size increases by 1 percentage point relative to world market capitalization would attract international bond holdings amounting to 0.27% of the bond assets held abroad by foreigners, according to the results for the full sample, but this coefficient is slightly smaller and insignificant in the case of the developing Asia sample (Panel A). This result is consistent with (French and Poterba 1991), who find that compared to simple benchmarks resulting from the CAPM the share of their portfolios that investors invest in foreign securities is much too low and deviates from unity.

One has to be careful when assessing the marginal effects of explanatory variables on home bias. Our preferred tobit estimator is non-linear, implying non-constant marginal effects of the explanatory variables. However, the relatively low degree of censoring in our sample would in practice allow for a direct interpretation of the estimated coefficients as marginal effects. This is confirmed by the fact that the results from the tobit estimation are very similar to those from the fixed effects model, which suggests that the possible bias introduced by fixed effects estimation is minimal (Panel B).

The coefficient of real exchange rate volatility is negative, as expected, and is statistically significant in the full sample. It thus appears that an increase in the volatility of real exchange rates in general tends to scare investors away from holding foreign debt securities. This result holds regardless of which measure of real exchange rate volatility we use; that is, the results are similar regardless of whether or not we use hedged exchange rates. The lagged value of the investment share enters significantly with a coefficient of about 0.54, suggesting the existence of inertia.

We then examine whether or not the risk-adjusted return matters rather than real exchange rate volatility. In Panel C, the risk-adjusted return on 3-year bonds is used in lieu of real exchange rate volatility. The results reveal that its coefficient is positive and statistically significant in both the full sample and the developing Asia sample, meaning that higher returns raise investment shares. This result is particularly strong for the developing Asia sample, in which the coefficients of other explanatory variables turn out to be generally insignificant, suggesting that the high risk-adjusted returns of the region were the primary factor that attracted foreign investors.

In all of the specifications, we include a GFC dummy (a dummy variable that equals one in 2009–11 and zero otherwise) to pick up any period-specific impacts between 2009 and 2011. The coefficient of the GFC dummy variable turns out to be positive and statistically significant in all of the specifications for both the full sample and the developing Asia sample. These results suggest that the foreign holdings of debt securities were significantly higher during the GFC period than during the tranquil period in our sample and that this was particularly so for developing Asia even after controlling for other factors that may have affected portfolio decisions.

We then examine whether or not the strength of home bias changed during the GFC period in Panel D by estimating equations that include relative market size interacted with a dummy variable for the years 2009–2011. The estimation results for the full sample suggest that foreign investors responded less to an increase in relative market size during the GFC period. In other words, foreign investors became more home biased during this period. However, the coefficient of the interactive variable was not statistically significant in the developing Asia sample, implying that the aforementioned tendency did not exist in the developing Asia sample and that foreign investors continued investing in developing Asia to the same extent as before during the GFC period, though still to a lesser degree than the optimal portfolio implied by the international CAPM. This result holds regardless of which measure of real exchange rate volatility we use.

Because of the volatility, or surge, in foreign holdings of short-term debt securities during the GFC, we also do our estimations for the case of foreign holdings of short-term

securities to see if there are any peculiarities. The estimation results for foreign holdings of short-term debt securities are shown in Table 2, Panels A–D. As can be seen from this table, the coefficients of the lagged dependent variable are much smaller in the case of short-term debt securities than in the case of all debt securities, suggesting that inertia is weaker in the case of short-term securities. Another difference relative to the results in Table 1 is that the coefficient of the GFC dummy is much higher: about 0.6–0.9 compared to about 0.2 in Table 1. Thus, investments in short-term debt securities were more volatile and, on average, the surge in foreign holdings of developing Asia's debt securities during the GFC period was especially pronounced in the case of short-term debt securities.

The results also show that real exchange rate volatility has a negative and statistically significant impact on foreign holdings of short-term debt securities, unlike in the case of debt securities of all maturities in developing Asia, as we saw in Table 1. This result holds regardless of which measure of real exchange rate volatility we use. Foreign investors apparently shied away from holding the short-term debt securities of other economies because of the volatility of exchange rates, and this tendency can be observed even in the developing Asia sample. Since Asian currencies were much more stable than Eurozone or UK currencies, this result implies that the surge in foreign holdings of the debt securities of developing Asian economies was due partly to lower exchange rate volatility in developing Asia. The coefficient of risk-adjusted returns continued to be significant in the case of foreign holdings of both total and short-term debt securities, which implies that the surge in foreign holdings of the short-term securities of the developing Asian economies was also due partly to the higher returns in developing Asia relative to the four major industrialized economies, particularly in the late 2000s.

Turning to the relevance of our findings in this section for the determinants of foreign holdings of short-term Japanese government securities discussed in the previous section, our finding in this section that risk-adjusted returns are a significant determinant of foreign holdings of debt securities corroborates our contention in section 4 that the fact that risk-adjusted returns elsewhere converged to Japanese levels in 2008–09 was responsible for the sharp increase in foreign holdings of short-term Japanese government securities after 2007.

6. Summary of Findings and Policy Implications

Looking first at our findings concerning government debt financing in Japan, although Japan's fiscal situation continues to be wobbly, Japan (in particular, the Japanese government) benefited greatly from the eurozone crisis because it prompted at least a temporary shift in the portfolios of foreign investors toward relatively safe Japanese government securities, especially short-term Japanese government securities, which in turn kept yields lower than they would have been otherwise. However, this situation will not continue indefinitely because risks in the rest of the world will eventually decline and because investor appetite for risk will eventually return as the eurozone crisis subsides. (In fact, Figure 7 shows that risk levels on government securities in economies and regions other than Japan had already declined sharply by early 2010.) Moreover, the

current situation is tenuous because the shortening of maturities on Japanese government securities, especially among foreign holdings of such securities, increases the difficulty of rollover and the risk of capital flight because bond markets are deepening and expanding in developing Asia, thereby creating competition for Japanese bonds, especially since they offer higher yields and the possibility of currency appreciation, and because household saving rates in Japan can be expected to decline even further due to the continuing aging of the Japanese population (Horioka 1989, 1991, 1992, and 1997). The share of foreign holdings of short-term Japanese government securities has been falling sharply since peaking at 30.2% in September 2012—presumably for all of the reasons mentioned above—and was only 26.8% in December 2012 and 28.6% in March 2013.

The policy implication of these findings for Japan is that the Japanese government still needs to get its fiscal house in order, preferably sooner rather than later. And the most obvious ways of doing so are to increase tax revenues (e.g., by increasing the consumption tax as the government is planning to do) and/or to cut government expenditures (e.g., by reforming the public pension system and other social safety nets). The problem is that it is hard to implement such reforms in a country in which the economy is stagnant and still recovering from the earthquake, tsunami, and nuclear power plant accident of March 2011 and in which the government has lacked the political will to implement necessary fiscal reforms for many years.

Turning to our findings concerning foreign debt holdings in developing Asia, we found that capital is fleeing—from the US and the eurozone economies—not only to Japan but also to other Asian economies due in large part to the expansion of bond markets in developing Asia.

Our econometric analysis suggests that, despite the increase in foreign holdings of debt securities, their share is still far lower than the optimal portfolio warranted by the capital asset pricing market model. In other words, foreign investors' home bias is still very strong. Home bias became even stronger during the GFC period, with the exception of developing Asia where foreign holdings remained stable, with foreign investors investing less in the major industrialized economies. The overall increase in foreign holdings of developing Asia's debt securities appears to be driven by relatively stable exchange rates and the higher risk-adjusted returns on the debt securities of this region. Additionally, we found that inertia is less evident in the case of foreign holdings of short-term debt securities and that they tend to be more volatile.

One lesson that developing Asia can learn from Japan is that capital is mobile internationally (though not fully mobile) and that it will flow to where the risk-return trade-off is the most attractive. If sovereign debt crises arise and/or are exacerbated in the eurozone or elsewhere, government securities in developing Asia will become relatively attractive as assets and foreign investors may well move their assets into debt securities in developing Asia. The rapid development of bond markets in developing Asia—which is presumably due in large part to high yields, favorable long-term growth prospects, and a high probability of currency appreciations—makes this possibility all the more likely. Needless to say, however, volatile capital flows, currency appreciations, and the adverse

trade and other impacts of the eurozone crisis will make macroeconomic management in developing Asia more difficult (Dornbusch 1986 and ADB 2012).

Data Appendix

Variable Name	Data Source	Definition
Equity	Coordinated Portfolio Investment Survey	Equity securities comprise all instruments and records that acknowledge claims on the residual value of corporations or quasi-corporations, after the claims of all creditors have been met (BPM6 paragraph 5.21). Shares, stocks, participations or similar documents (e.g., American Depositary Receipts) usually denote ownership of equity. *(IMF-CPIS definition)*
Debt Securities	Coordinated Portfolio Investment Survey	Debt securities are negotiable instruments serving as evidence of a debt. They give the holders the unconditional right to fixed or contractually determined variable payments (i.e., earnings of interest is not dependent on earnings of the debtors). The maturity of a debt instrument is classified as either long-term (a maturity of more than 1 year or with no stated maturity, other than on demand), or short-term (payable on demand or with a maturity of 1 year or less). *(IMF-CPIS definition)*
Foreign Assets held by Domestic Residents	Derived using data from Coordinated Portfolio Investment Survey	Total value of equity or debt investment from world to destination country. For developing Asia, foreign assets held by domestic residents are the total value of equity or debt investment from the world to developing Asia (Hong Kong, China; India; Indonesia; Japan; the Republic of Korea; Malaysia; Pakistan; the Philippines; Singapore; and Thailand).
Domestic Assets held by Foreign Residents	Derived using data from Coordinated Portfolio Investment Survey	Total value of equity of debt investment from source country to world. For developing Asia, domestic assets held by foreign residents are the total value of equity or debt investment from developing Asia (Hong Kong, China; India; Indonesia; Japan; the Republic of Korea; Malaysia; Pakistan; the Philippines; Singapore; and Thailand) to the world.

Data Appendix: *Continued*

Variable Name	Data Source	Definition
Domestic and World Equity Market Capitalization	World Bank's *World Development Indicators (WDI)*	Market capitalization (also known as market value) is the share price times the number of shares outstanding. Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the year. Listed companies do not include investment companies, mutual funds, or other collective investment vehicles. Data are in current US dollars. *(WDI Definition)*
Domestic Debt Market Capitalization	Bank for International Settlements	Outstanding debt securities (domestic + international debts) of a country
World Debt Market Capitalization	Derived using data from Bank for International Settlements	Total of the outstanding debt securities (domestic + international debts) of the countries available in the BIS database
Foreign Asset Acceptance Ratio (Home Bias Index)	Derived	Measures the extent to which the share of foreign assets in an investor's portfolio diverges from the share of foreign assets that would be held in a "borderless" global portfolio. A ratio of 100% entails no divergence and therefore no home bias; a lower ratio means greater measured home bias. The index is computed as (foreign assets held by domestic residents / (domestic market capitalization + foreign assets held by domestic residents – domestic assets held by foreign residents)) / ((world market capitalization –domestic market capitalization) / world market capitalization).

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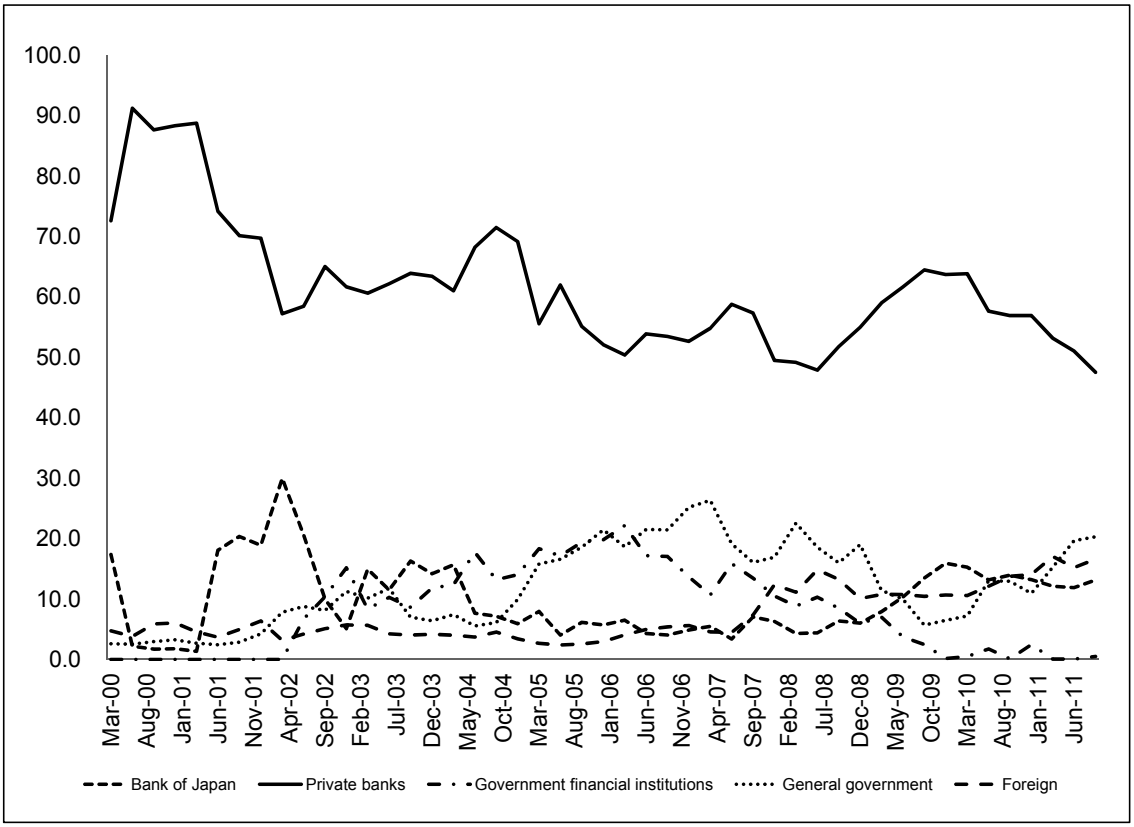
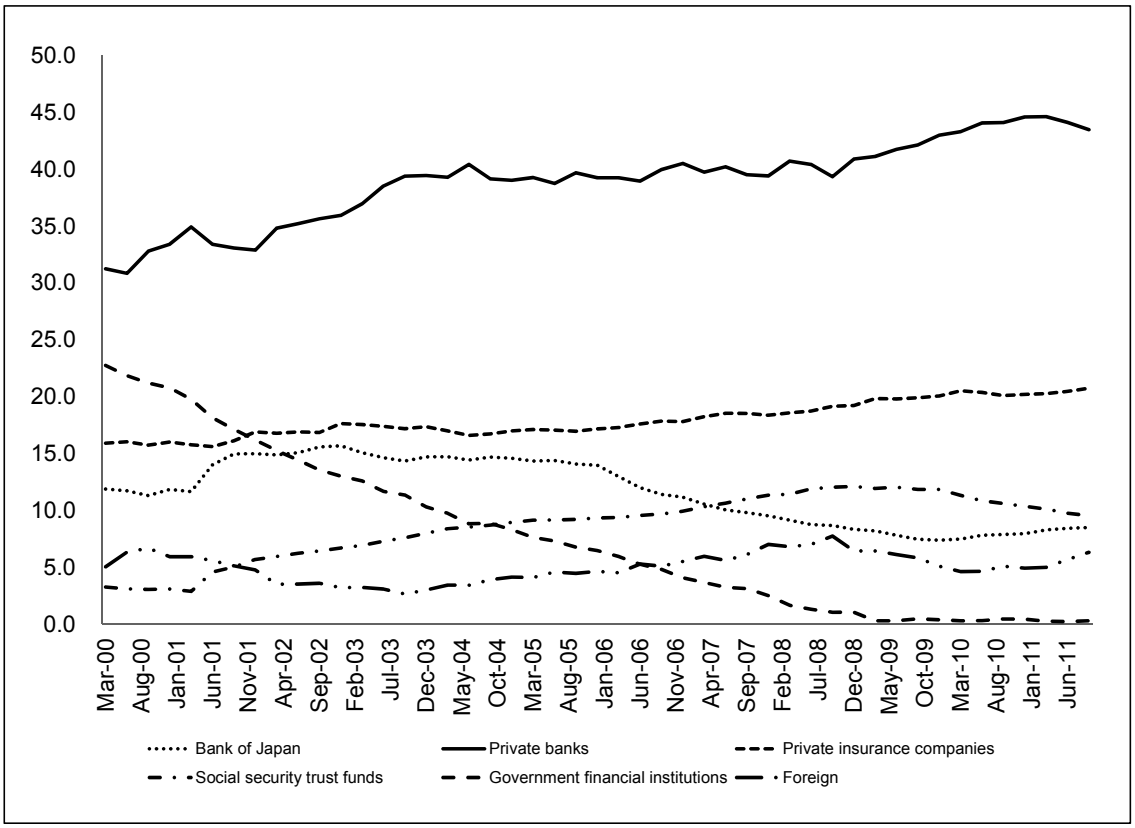
Figure 1: Holding of Short-term Japanese Government Securities by Sector, 2000–2011 (shares)



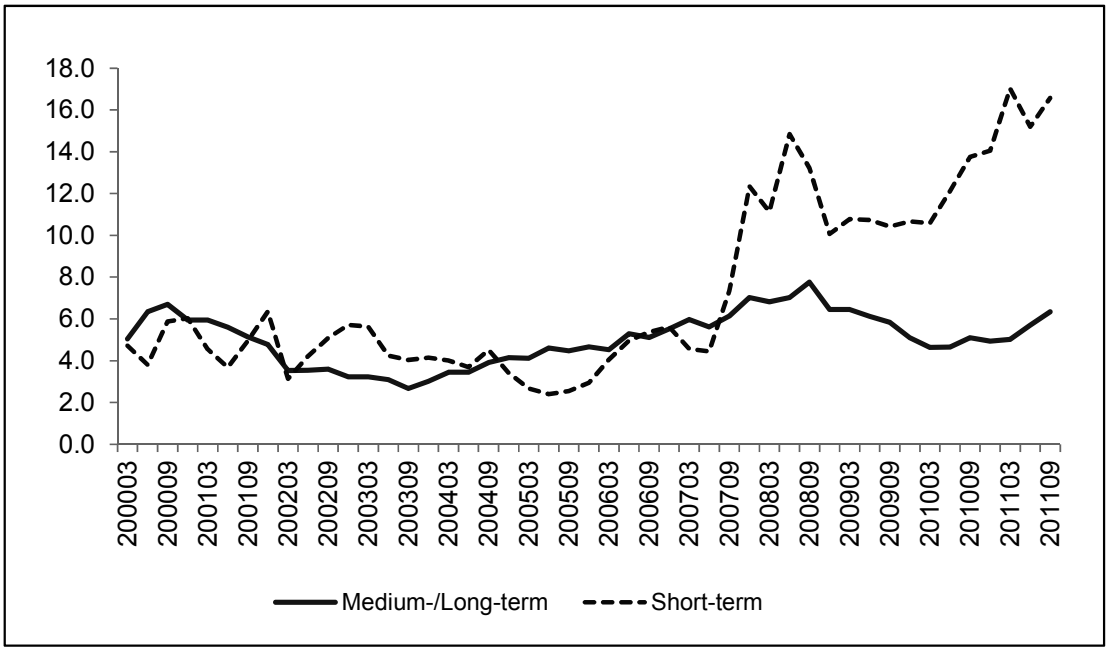
Source: Flow of Funds Accounts Statistics, Bank of Japan.

Figure 2: Holdings of Medium-term and Long-term Japanese Government Securities by Sector, 2000–2011 (shares)



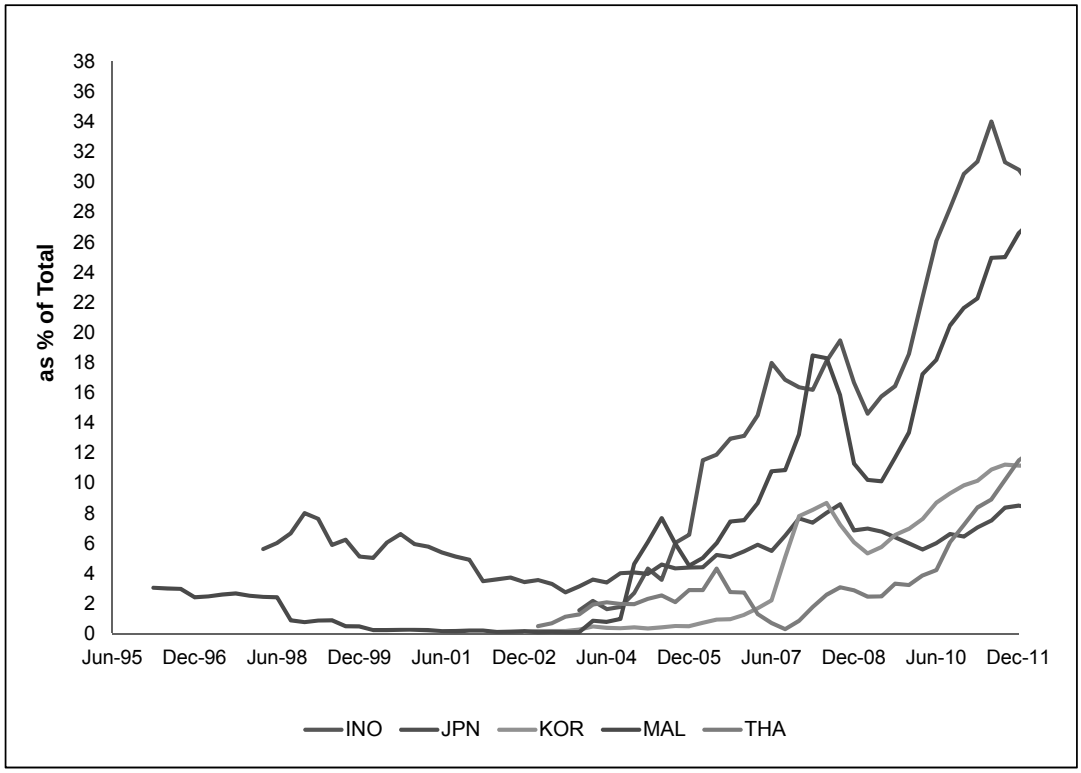
Source: Flow of Funds Accounts Statistics, Bank of Japan.

Figure 3: Share of Foreign Holdings of Japanese Government Securities, 2000–2011 (shares)



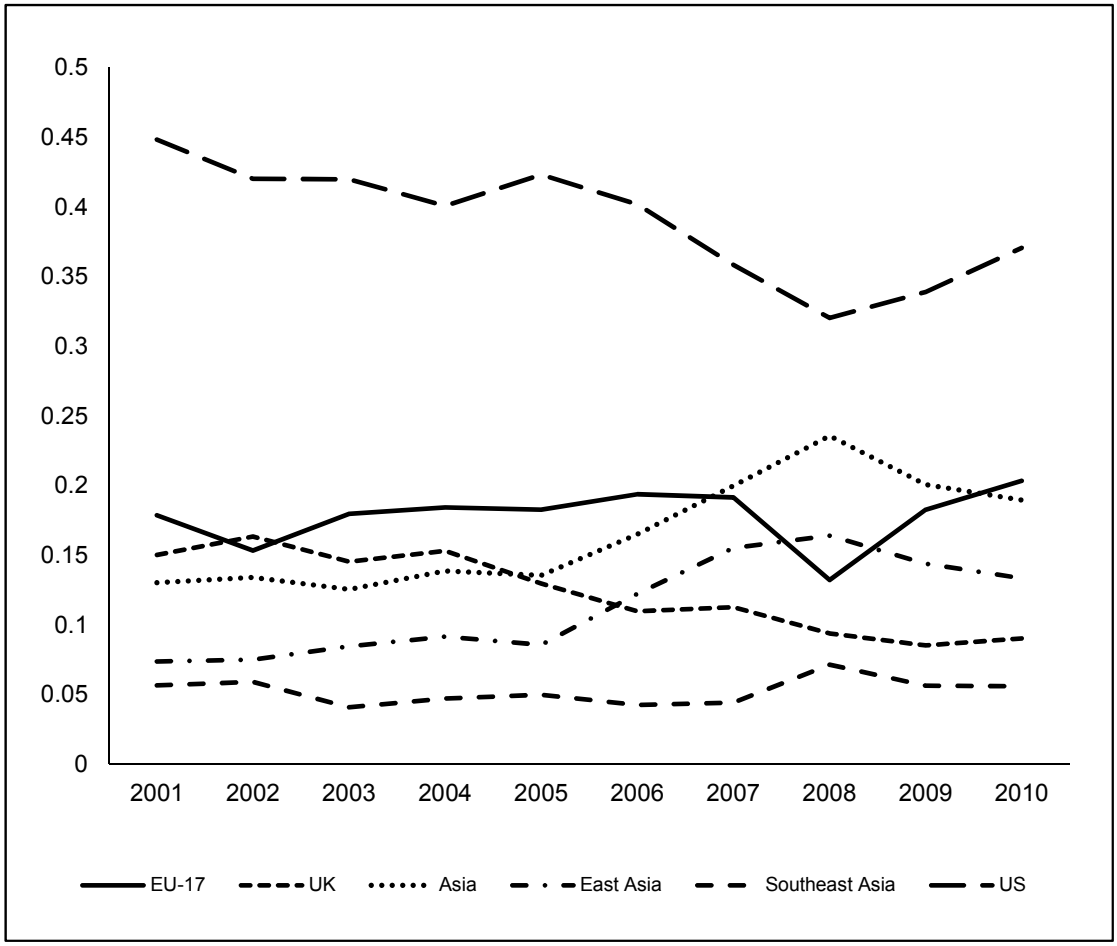
Source: Flow of Funds Accounts Statistics, Bank of Japan.

Figure 4: Share of Foreign Holdings of Government Bonds in Asia (shares)



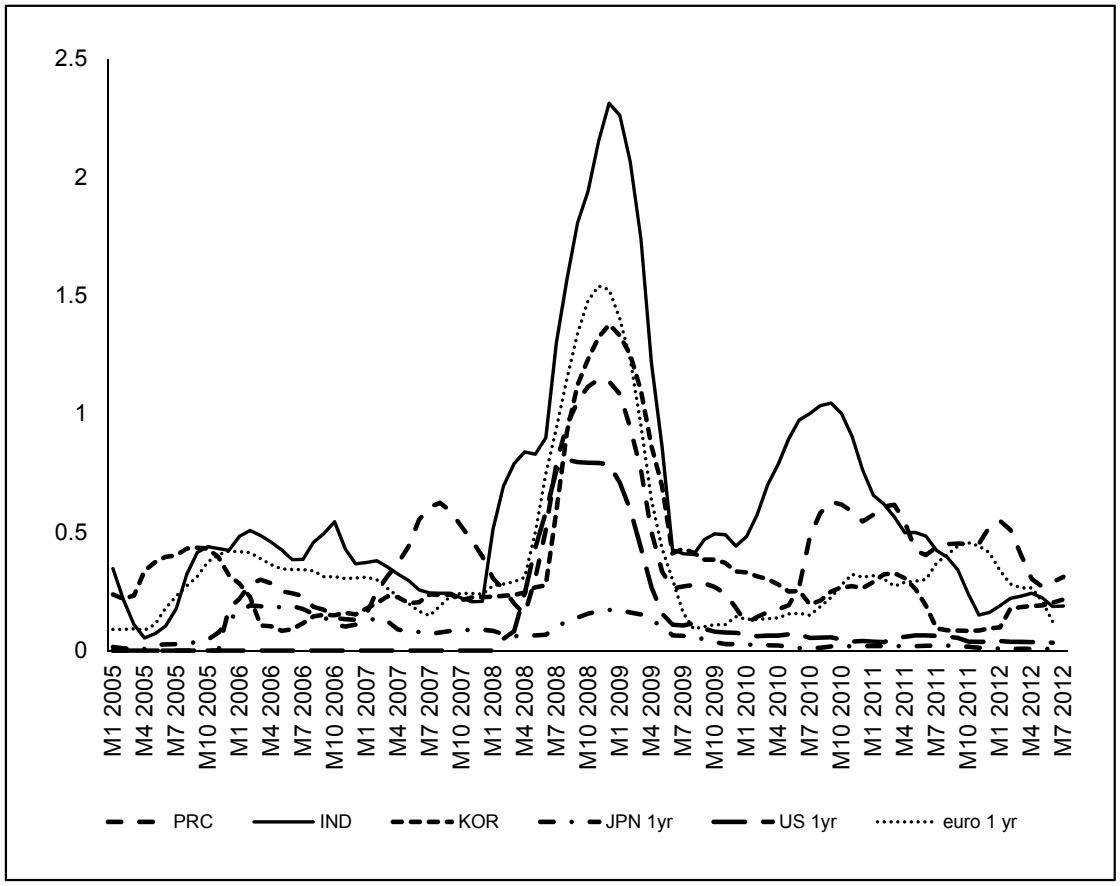
Source: *AsianBondsOnline.*

Figure 5: Share of Each Economy or Region in the Total Foreign Debt Holdings of Developing Asia, 2001–10 (shares)



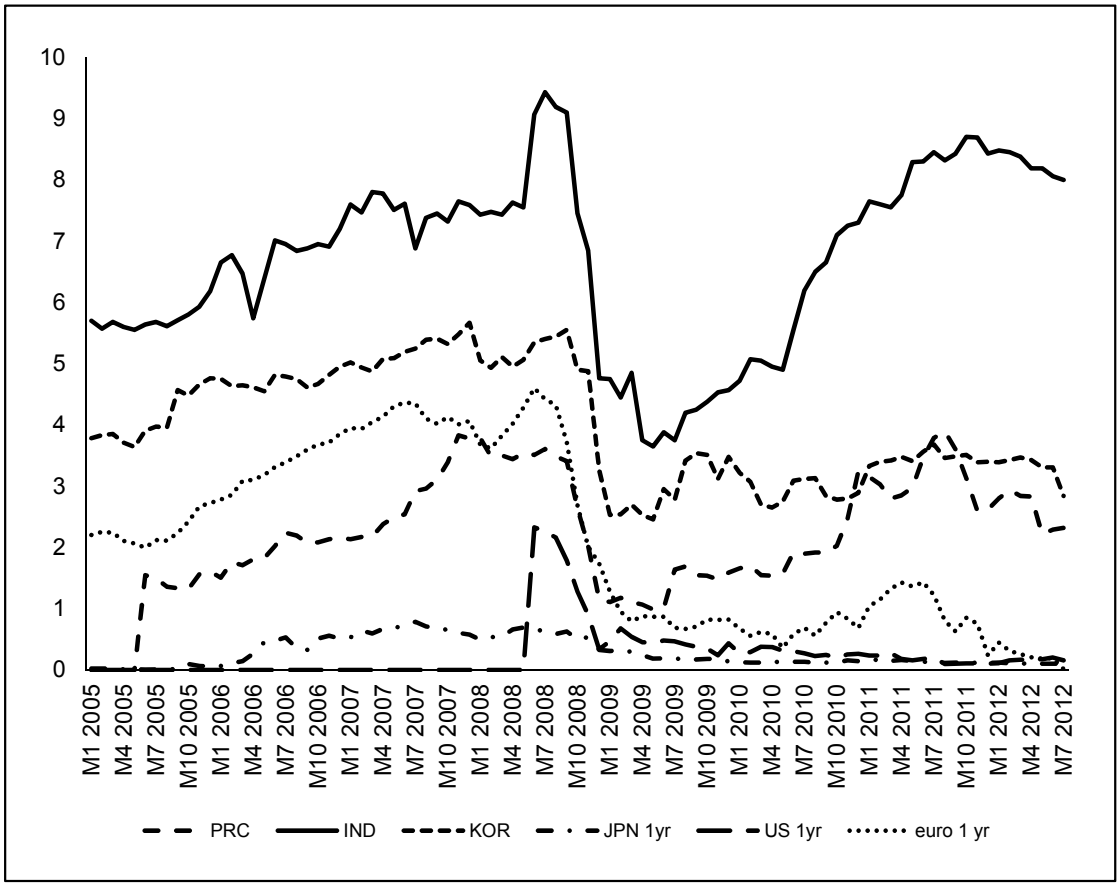
Source: International Monetary Fund's (IMF) *Coordinated Portfolio Investment Survey*.

Figure 6: Hedged Returns on One-year Dollar Bonds in Selected Economies and Regions, 2005-2012 (%)



PRC = People's Republic of China; IND = India; KOR = Republic of Korea; JPN = Japan; US = United States.
Note: Hedged returns are returns that are hedged against currency risk.
Source: Authors' own calculations using data from the Bloomberg financial data base.

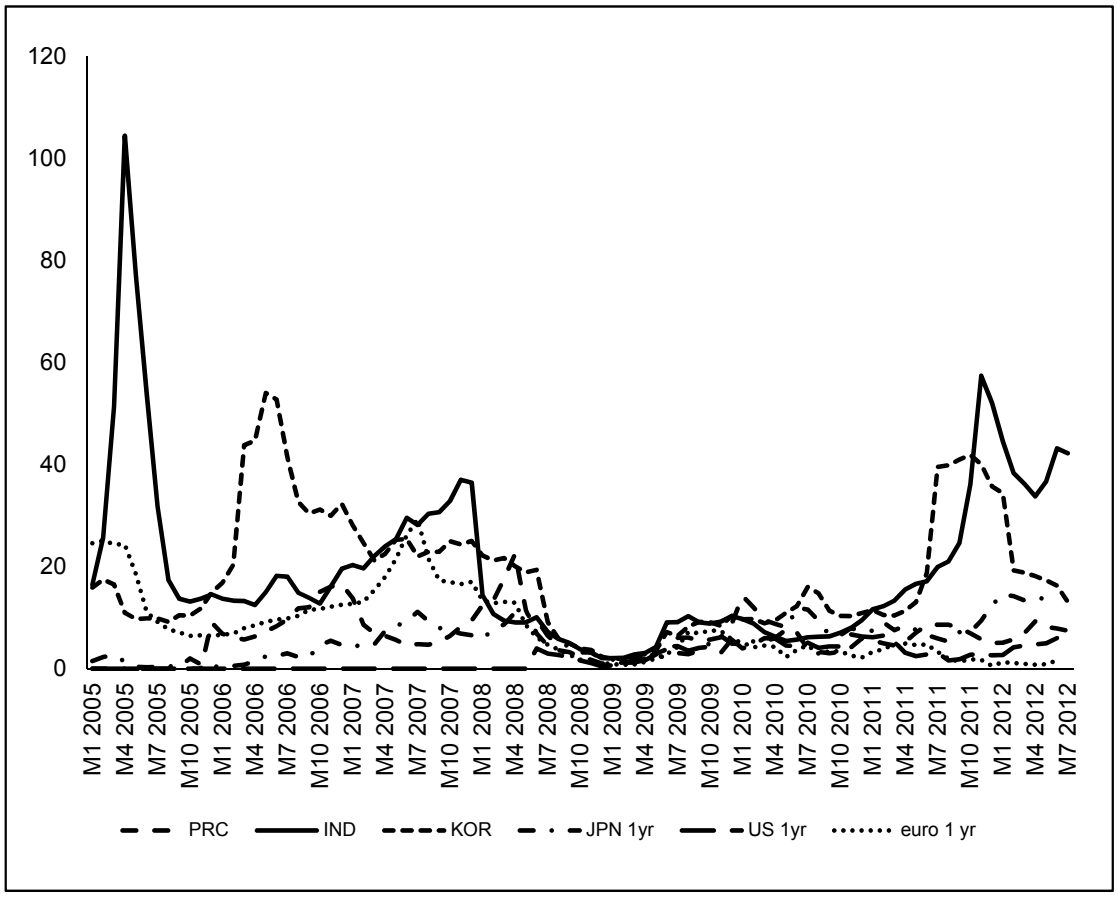
Figure 7: Rolling Standard Deviations of Hedged Returns on One-year Dollar Bonds in Selected Economies and Regions, 2005-2012 (%)



PRC = People's Republic of China; IND = India; KOR = Republic of Korea; JPN = Japan; US = United States; euro = eurozone.
Note: The rolling standard deviation of hedged returns was calculated using a 12-month window with the current month being the seventh month.

Source: Authors' own calculations using data from the Bloomberg financial data base.

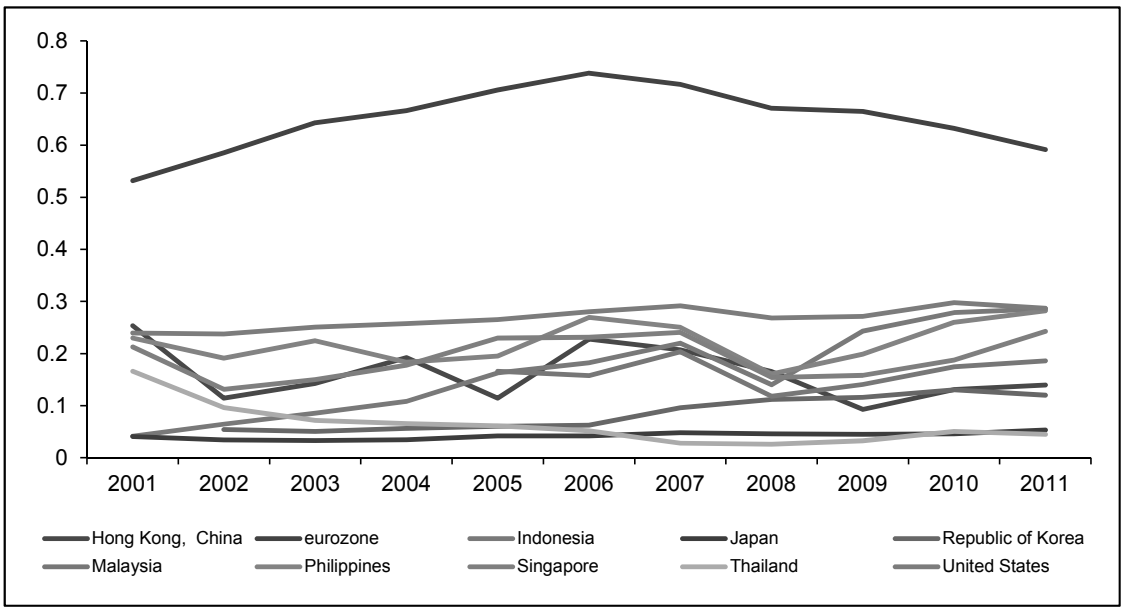
Figure 8: Risk-adjusted Hedged Returns on One-year Dollar Bonds in Selected Economies and Regions, 2005-2012 (%)



PRC = People's Republic of China; IND = India; KOR = Republic of Korea; JPN = Japan; US = United States; euro = eurozone.
Note: The risk-adjusted hedged return was calculated by dividing the hedged return by the rolling standard deviation of hedged returns.

Source: Authors' own calculations using data from the Bloomberg financial data base.

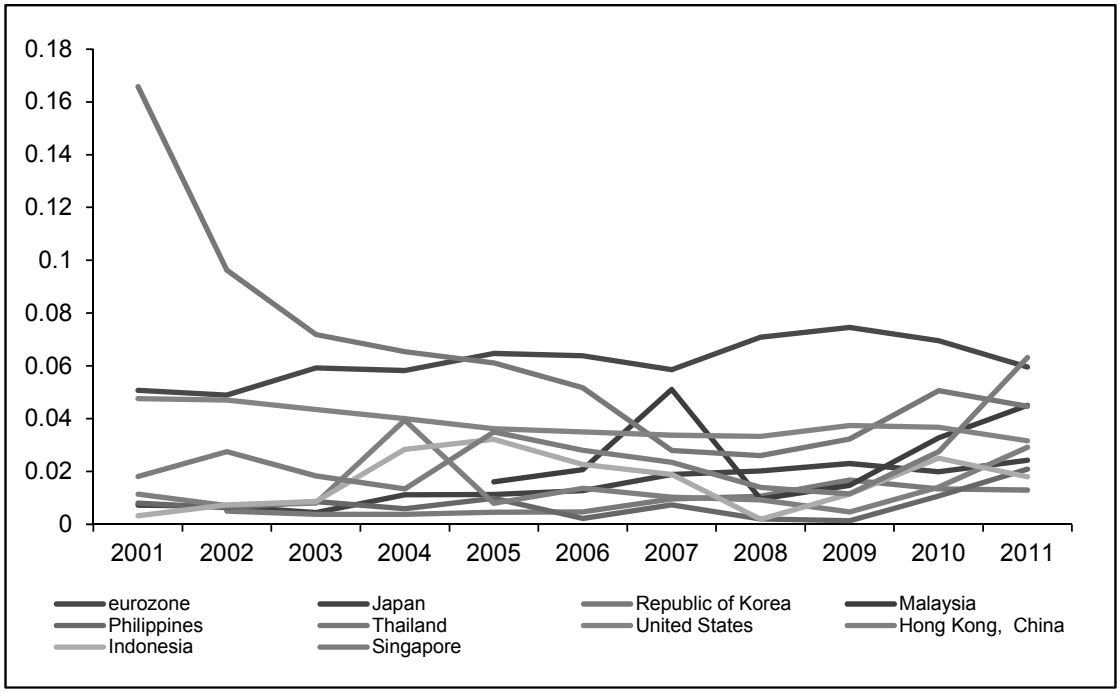
Figure 9: Home Bias Index (Debt Securities of All Maturities)



Note: Shows the ratio of foreign holdings of total debt securities to the foreign market capitalization of total debt securities divided by the ratio of the domestic market capitalization of total debt securities to the worldwide market capitalization of total debt securities.

Source: Refer to the Data Appendix.

Figure 10: Home Bias Index (Short-term Debt Securities)



Note: Shows the ratio of foreign holdings of short-term debt securities to the foreign market capitalization of short-term debt securities divided by the ratio of the domestic market capitalization of short-term debt securities to the worldwide market capitalization of short-term debt securities.

Source: Refer to the Data Appendix.

Table 1: Estimation Results (Foreign Holdings of Debt Securities of All Maturities as a Share of the Foreign Market Capitalization of Debt Securities of All Maturities)

Variables	Fixed effects Model		Tobit Model					
	A		B		C		D	
	Whole	Asia	Whole	Asia	Whole	Asia	Whole	Asia
ln (Portfolio size)	0.278	0.188	0.278	0.179	0.236	0.075	0.207	0.182
	(0.141)	(0.176)	(0.131)	(0.160)	(0.120)	(0.166)	(0.132)	(0.160)
ln (Portfolio size)* dGFC							-0.488**	0.031
							0.023	(0.083)
ln (Real exchange rate volatility)	-.108*	-.101	-.108*	-.101			-0.097*	-0.034
	(0.058)	(0.075)	(0.068)	(0.068)			(0.053)	(0.074)
ln (Risk adjusted return)					0.133***	0.154**		
					(0.014)	(.068)		
Lag of in (Portfolio size)	0.541***	0.544***	0.541***	0.544***	0.371***	0.355***	0.522***	0.615***
	(0.074)	(0.087)	(0.068)	(0.080)	(0.081)	(0.106)	(0.067)	(0.077)
dGFC (dummy for 2009–2011)	0.183***	0.272***	0.183***	0.272***	0.230***	0.359***	0.186***	0.313**
	(0.055)	(0.078)	(0.068)	(0.071)	(0.50)	(0.083)	(0.049)	(0.131)
No. of Observations	95	65	95	65	95	65	95	65

Notes: Country dummies are also included, but their coefficients are not shown due to space limitations. Standard errors are shown in parentheses. Significance at the 99%, 95%, and 90% levels are denoted by ***, **, and *, respectively. The right-censoring limit is set at 3.

Table 2: Estimation Results (Foreign Holdings of Developing Asia's Short-Term Debt Securities as a Share of the Foreign Market Capitalization of Short-Term Debt Securities)

Variables	Tobit Model			
	A	B	C	D
ln (Portfolio size)	-.323	-0.316	-0.325	-0.293
	(0.436)	(0.443)	(0.447)	(0.446)
ln (Portfolio size)* dGFC				.213
				(0.252)
ln (Real hedged exchange rate volatility)	-0.364*			
	(0.185)			
ln (Real exchange rate volatility)		-0.365*		
		(0.189)		
ln (Risk adjusted return)			0.283*	0.280*
			(0.162)	(0.161)
Lag of ln (Portfolio size)	0.286**	0.274**	0.286**	0.232
	(0.118)	(0.126)	(0.127)	(0.141)
dGFC (dummy for 2009–2011)	0.687***	0.672***	0.666***	0.923**
	(0.193)	(0.198)	(0.199)	(0.363)
No. of Observations	65	63	63	63

Notes: Country dummies are also included, but their coefficients are not shown due to space limitations. Standard errors are shown in parentheses. Significance at the 99%, 95%, and 90% levels are denoted by ***, **, and *, respectively. The right-censoring limit is set at 3.

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Explaining Foreign Holdings of Asia's Debt Securities

This paper analyzes data on trends since 2000 in foreign holdings of government securities and other debt securities with emphasis on Japan and developing Asia. It finds that foreign residents generally increased their holdings of Asian debt securities during the sample period, especially during the post-global financial crisis (GFC) period. Our empirical analysis suggests that, despite the increase in foreign holdings of debt securities, their share is still far lower than the optimal portfolio warranted by the capital asset pricing market theory. In other words, foreign investors' home bias is still strong. The overall increase in foreign holdings of Asian debt securities appears to be driven by relatively stable exchange rates and the higher risk-adjusted returns on the debt securities of the region.

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